VR and AR in ArcGIS: An Introduction

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Agenda

• Product Overview and Terminology - Taisha
• Mobile VR and AR – Eric
• Introduction to Gaming Engines – Covered Earlier
• AR with ArcGIS Runtime – Adrien (gone to France) and Rex
AR - Augmented Reality

Interacting with outside world

Mobile Devices
**Global Positional Tracking**

Accuracy:
- GPS: ~10m, outside-only
- Wi-Fi: ~2m
- Beacon: ~1m
- RFID: ~1m
Standard AR
AR with ArcGIS Runtime

- Game engine (Unity & Unreal)
- CityEngine
- ArcGIS Runtime beta as XR dev environment best suited for mobile AR
- ArcGIS 360 VR: out-of-the-box mobile VR for Oculus Go & Samsung Gear
- CityEngine VR Experience: out-of-the-box premium VR via Unreal project template
- Game engine (Unity & Unreal): professional XR dev environment

GIS data -> CityEngine
Mobile AR

- **AuGeo**
  - a mobile app to display GIS data in AR

- **CityEngine VR Experience**
  - out-of-the-box premium VR via Unreal project template

- **Game engine (Unity & Unreal)**
  - professional XR dev environment

- **ArcGIS Runtime beta**
  - as XR dev environment best suited for mobile AR

**GIS data** -> CityEngine -> AuGeo, CityEngine VR Experience, Game engine (Unity & Unreal), ArcGIS Runtime beta
MR – Mixed Reality

Mixed presence

Microsoft HoloLens & Magic Leap
Global Positional Tracking

Challenge for phones and AR/MR headsets:
• Inside-out motion tracking, but
• Needs initial position
MR with CityEngine

GIS data → CityEngine

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  out-of-the-box mobile VR for Oculus Go & Samsung Gear
VR - Virtual Reality

Being there

HMD
motion sickness is major problem for adoption of VR
Mobile VR versus Premium VR

- Low price
- Broad reach
- Graphics limited
- Bandwidth limited
- Only 3 DoF still

- High cost
- Complex setup
- Great graphics
- Free movement
- Advanced controllers
Mobile VR

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Premium VR with CityEngine

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Professional XR dev environment.
Table-scale a.k.a. the “Tabletop” UX

• Common UX pattern in MR, VR & AR
• Collaborative
• Intuitive, people relate to table
• No motion sickness
XR with ArcGIS

ArcGIS 360 VR
out-of-the-box mobile VR for Samsung Gear
planned: support for Oculus Go

New: CityEngine VR Template for Urban Planning
out-of-the-box premium XR experience

Game engine
as XR dev environment
planned: ArcGIS Runtime plug-ins

ArcGIS Runtime beta
as XR dev environment
best suited for mobile AR

Esri CityEngine

GIS data

Import
Sync
Stream

Planned: streaming from ArcGIS Online/Enterprise into game engines

Datasmith

3VR

Datasmith

FBX

Stream Packages (offline)
Mobile VR and AR
ArcGIS 360° VR

Experience 3D in first person

Share VR experiences via the web

Compare scenarios interactively
ArcGIS 360 VR Experience & 360 Viewer

- **A new Esri supported format: .3VR**
  - Composed of multiple rendered photospheres
  - Can store views from multiple locations
  - Can switch between locations using visual bookmarks in scene
  - Each location can store multiple states, such as design scenarios
  - Can switch between scenarios

- **How is it authored:** Created from CityEngine scenes, with plans in the future to support authoring from other applications, and consumption of spherical photography

- **How is it viewed:** In a VR application for Samsung Galaxy (eventually other devices). Additional support for viewing by a web app.
3VR Specification

```json
{
    "views": [
        {
            "name": "State Street Park",
            "camera": {
                "position": [27.5, -105.0625, 255.07031],
                "positionGlobal": [-14680503.451115916, 171302.8003556006, 3268198.8452125844],
                "tilt": 57.601192,
                "heading": -43.801823
            },
            "content": [
                {
                    "scenarioRef": "./scenarios/0"  # ref to scenario ('orthogonal' to views)
                }
            ],
        }, ...
    ],
    "data": [
        {
            "cube": {
                "href": "./resources/State_Street_ParkScenario_1.jpg",
                "thumbnail": "./resources/State_Street_ParkScenario_1_preview.jpg"
            }
        }, ...
    ],
    "scenarios": [
        {
            "name": "Scenario 1",
            ...
        }, ...
    ],
    "scene": {
        "crsGlobal": "EPSG:3857",
        "crsLocal": "EPSG:2229",
        ...
    }
}
```
Creation and Consumption

Authoring
- generate JPG panoramas with index.JSON & upload as .3VR

Consumption
- download index.JSON & request/cache JPG panoramas

CityEngine + other tools later

360 VR Experience on ArcGIS Online/Portal

ArcGIS 360 VR x-platform viewer app
Esri Labs is proud to present ArcGIS 360 VR. The ArcGIS 360 VR app allows you to quickly immerse yourself into 3D city models by teleporting to static viewpoints and comparing different urban design scenarios. These VR experiences can be easily created with the 3D modeling software, CityEngine, and are hosted on ArcGIS Online, the cloud platform of the global smart mapping leader, Esri. Rather than relying on high-performance graphics computers and cumbersome wired VR accessories, a simple smartphone paired with an affordable wireless headset are all that is required to be immersed in a ArcGIS 360 VR experience.

“By using ArcGIS 360 VR, our planning board and jurors can now study the impact of new architectural developments and urban planning scenarios from the perspective of pedestrians and citizens.” Christian Huerzeler, project manager at the Department of Urban Planning in Zurich.

The app is available for the Samsung Gear VR headset on the Oculus platform. Join this Esri Labs project and we will send you a promo code to access the app.

**Requirements**

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<td>Samsung Gear VR headset</td>
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Join this Esri Labs project
What's coming next

- Support for Oculus Go
- Publishing 360 imagery from CE

Improvements
- Hand controller support
- View to view customization

Near-term
- Support for Oculus Go
- Publishing 360 imagery from CE

Mid-term
- Web-based app for AGO
- Animation and video support
AuGeo

• A mobile app to display your GIS features in an Augmented Reality environment.

• Completely out of the box. Easy to setup.

• Available for iOS and Android

• By Esri Labs

• Source code available with AppStudio for ArcGIS, tutorial available on YouTube
AR with ArcGIS Runtime
Developers want to use their live and local authoritative GIS content and analytics across the mixed reality spectrum.

Critical needs for usability:
- Virtual reality needs high fidelity and responsive performance
- Augmented reality needs positional accuracy
Supporting Mixed Reality with ArcGIS Runtime today

• Enhance existing ArcGIS Runtime SDKs
  - Integrated with the ArcGIS Platform
  - 3D already supported on all platforms/devices
  - Native apps able to access sensors/controllers

• Private beta program!
  - SDKs for .NET, iOS, Android
  - Targets mobile devices

Request access to the beta program, email: ArcGISRuntimeARVRBeta@esri.com
Supporting Mixed Reality with ArcGIS Runtime in the future

• Integrate with game engines
  - New light-weight Runtime API – no rendering engine
  - Good for MR but also any “gaming type” application that needs GIS
  - Easy cross hardware development
  - Good MR UI design experience
  - Integration with the existing MR community
  - Physics and other 3D effects
ArcGIS Runtime
AR demo
Adrien Meriaux
Please Take Our Survey on the App

Download the Esri Events app and find your event

Select the session you attended

Scroll down to find the feedback section

Complete answers and select “Submit”
Get in touch…

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